PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY

MEETING OF DECEMBER 18, 1934

A regular meeting of the Society was held on December 18, 1934, in the American Museum of Natural History with Vice-President Schwarz in the chair and twenty-three members and nine visitors present.

Dr. Roland F. Hussey was elected an active member of the Society.

Mr. and Mrs. M. R. Frank were proposed for membership.

Dr. A. B. Klots read his paper, the second in the series on the subject "Present Problems of Species Concept." An abstract of Dr. Klots' paper appears below, under the title "Viviparity in Insects."

Dr. Klots' paper was discussed by Messrs. Ruckes, Horsfall, Moore, Curran, Weiss, Speith and Bird.

Dr. Moore declared, in part, that hybrids in evolution are not given enough importance by the evolutionist; and also, that physiological differences are just as valuable as structural differences in establishing a species.

Dr. Ruckes stressed the importance of one mutation arising from the presence of other mutations; also, he mentioned the breeding season as an important factor in dealing with this problem.

ELIZABETH S. ENGELHARDT, *Secretary*

VIVIPARITY IN INSECTS

The embryologist recognizes three types of bigametic reproduction, *i.e.*, *oviparity*, *ovoviviparity*, and *viviparity*. In the field of insect embryology, examples of the first and last groups are well-known and clear-cut, but those of the second category are quite unsatisfactory for observing stages in development from the time of fertilization to the instant of hatching, because developing eggs of different insect species vary a great deal. In certain cases (*Orenia*, Coleoptera; some Plectoptera) eggs hatch in less than a minute after deposition. My personal opinion is that oviparity refers to laying of eggs in which the chorion is intact while viviparity applies to the bearing of live young that have been freed from the enveloping chorion, if indeed, the latter membrane be present at all. It is wanting, for instance, in all Strepsiptera, all Polyctenidæ, *Hemimerus*, (Orthoptera) and parthenogenetic aphids. Therefore, the term ovoviviparity in this connection is superfluous.

Several attempts have been made to classify the types of insect embryological development. Holmgren's plan has been most widely cited and generally used. Comstock adopted and improved upon it by inferring but not actually using a physical basis of separation. It appears that viviparous insects illustrate four types of viviparity, when physical and physiological adaptations on the part of the parent and her offspring are considered; these are:

1. *Ovoviviparity*:—The eggs are passed into the uterus with an adequate supply of nutriment (yolk) to bring the contained embryos to full growth by hatching time. The only clearly visible adaptation is the distensibility of the maternal uterus which in expanding serves as a reservoir for the developing ova until they hatch. A psychic change in the parent no doubt

occurs, for she must become accustomed to the presence of a cluster of eggs and later hatched young in her uterus (Chrysomelidæ, Sarcophagidæ).

2. *Adenotrophic viviparity*:—In these cases (flies) the eggs are supplied with sufficient yolk to carry them through hatching, but one pair of accessory glands of the parent discharges fluid into the uterus upon which the larvæ feed until full grown. Deposition is then immediately followed by pupation. Here again physical, psychical, and physiological changes take place in the female parent and the offspring is modified too.

In the larvæ only an oral opening fitted with a sucking tongue represents the former mouth and buccal armature; the musculature has largely disappeared and the mid-intestine no longer connects with the protodæum; psychically they have changed from active voracious maggots to placid creatures waiting for food to come to them. Correlated with this type of development we find that the parent bears only one offspring at a time; the adult repeatedly bears young, however, throughout her entire mature life. (*Glossina* and the Pupipara).

3. *Exgenital viviparity*:—The mature ovaries rupture and eggs are dispersed into the hæmocoel, where development proceeds at the expense of the maternal tissues, especially the fat bodies. In *Miastor* the yolk is sufficient to carry the development of the egg to hatching but the larvæ literally eat their "mother." In some Strepsiptera the embryonic serosa absorbs nourishment for the embryo since the ovum has little or no yolk; in others, where more ovarian nutriment is present, this process is considerably delayed. The female is pædogenetic in *Miastor* and the escaping larvæ (10 to 25 in number) cause her death. In the Strepsiptera the oviducts do not function during "birth" and the hundred of triungulinids are carried through brood canals and brood chambers to the outside without killing the parent.

4. Pseudoplacental viviparity:—In these cases the egg does not possess a chorion and the embryo soon establishes a physical union with the maternal tissues. No yolk is present but a small amount of a fatty substance is available for the first few developmental divisions. The pseudoplacenta may be a permanent structure (Hemimerus). In the Polyctenidæ the outer embryonic wall forms an absorbing layer which rests against the inner surface of the oviduct. In all these cases the young are born singly and at intervals throughout the life of the parent.

The detailed adaptations of both parent and young are too numerous and profound to be discussed in this report. A few have been suggested in the above outline.

Viviparous insects reported, in addition to those cited above, are given in the following list. Doubtful cases are questioned.

1. Oviviparous: *Carotoca, Spiractha* (Staphylinidæ); several Tachinidæ; Aphidæ and several Coccidæ; *Tinea* and *Colias* (Lepidoptera); *Blatta, Blabera* (Orthoptera); *Chloon* (Plectoptera)?; *Megathrips* (Thysanoptera); a species of Anopleura.

3. Exgenital: *Micromalthus* (Coleoptera); *Tanytarsus* (Diptera); all species of Strepsiptera.